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ABSTRACT

A multi-year project was initiated to examine production equipment issues related to implementation of the Dietary Guidelines for Americans (DGA). The purposes of the research project were to determine foodservice directors' opinions regarding use and appropriateness of equipment in school foodservice, to identify the number and variety of menu items offered in elementary, middle/junior high, and high schools, and to examine the foodservice equipment currently available in school kitchens. A mail questionnaire was sent to a national, random sample of 4000 school foodservice directors; 2245 (fifty-six percent) returned the questionnaire. Findings reflect an increased awareness of preparing school meals that implement the nutrition principles of the DGA, and that a greater percentage of schools are offering menus with more meal choices. Additionally, data show that 96% of the directors rated convection ovens the highest among 31 food service equipment items as appropriate for implementing the DGA, and 89% agreed that there was a need for greater refrigerated space when fresh fruits and vegetables are offered. The report recommends greater training on appropriate equipment for implementing dietary guidelines, more research on the type and amount of additional space needed by expanding menu choices to meet the DGA, and that the National Food Service Management Institute establish a partnership with the North American Association of Food Equipment Manufacturers to develop strategies for educating food service directors about new food preparation equipment. An appendix provides the Equipment Issues Questionnaire. (GR)

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ED 429 428

ISSUES RELATED TO EQUIPMENT AND THE DIETARY GUIDELINES FOR AMERICANS

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March, 1996

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ISSUES RELATED TO EQUIPMENT AND THE DIETARY GUIDELINES FOR AMERICANS

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PREFACE

Research conducted by the National Food Service Management Institute has indicated that facility layout and design and equipment purchasing is an important job function of school foodservice directors, and yet, the U.S. Department of Agriculture has not addressed the issue of equipment purchasing or the status of foodservice equipment in the nation's schools for over ten years. In 1994, the National Food Service Management Institute began a multi year project to identify the opinions of school foodservice directors on key equipment issues and the status of equipment in their schools. This report, the first of several, examines production equipment issues related to the implementation of the *Dietary Guidelines for Americans*.

Drs. Mary Gregoire and **Mary Frances Nettles** conceived and designed this research. **Dr. Nettles** and **Ms. Deborah Carr** nurtured the project to reality through all its various stages. **Ms. Lisa Odom** gave invaluable help in data entry and manuscript preparation. We would be remiss if we also did not mention the time and commitment of over 2,000 school foodservice directors who returned questionnaires. We are indebted to all.

Martha T. Conklin, PhD, RD
Director of Applied Research

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Executive Director

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ISSUES RELATED TO EQUIPMENT AND THE DIETARY GUIDELINES FOR AMERICANS

EXECUTIVE SUMMARY

Overview

In 1990, the United States Department of Agriculture (USDA) and the U.S. Department of Health and Human Services issued the third edition of *The Dietary Guidelines for Americans* (DGA) (U.S. Departments of Agriculture and Health and Human Services, 1990). In 1995, regulations governing nutrition standards for the National School Lunch and School Breakfast Programs were amended to phase in the requirement that school meals comply with the nutrition recommendations of the DGA. Equipment used for production of meals is a critical element in effective implementation of the DGA. The most recent large-scale study to examine foodservice equipment in schools was conducted by USDA in 1980 (Puma, 1983). In addition, research has not been conducted to examine the use of foodservice equipment in relationship to implementing the DGA.

Research scientists at the National Food Service Management Institute (NFSMI) initiated a multi-year project to examine production equipment issues related to implementation of the DGA. The purposes of this portion of the research project were to determine foodservice directors' opinions regarding use and appropriateness of equipment in school foodservice; and to identify the number and variety of menu items offered in elementary, middle/junior high, and high schools. The final portion of the research project will examine the foodservice equipment currently available in school kitchens.

A mail questionnaire was sent to a national, systematic random sample of 4000 school foodservice directors. Directors were asked to assess how appropriate 31 pieces of equipment are for storage, preparation, or service of meals in school foodservice. They also were asked to indicate their level of agreement with 37 recommendations regarding equipment use in schools. The final four sections requested information about the school district; elementary schools, middle/junior, and senior high schools; and the district director.

Fifty-six percent (2245) of the directors returned the questionnaire. Respondents were employed in school districts located in all of the USDA regions. The largest percentage (24%) of school foodservice directors worked in the Midwest region. Over two thirds of the respondents reported that they had worked as a school foodservice director between five and twenty years while 25 percent had been employed less than five years.

Major Study Findings

Directors were asked to rate the appropriateness of 31 foodservice equipment items used in school kitchens for implementing the Dietary Guidelines for Americans. Six equipment items were identified by 75 percent or more of the respondents as appropriate for school kitchens. The equipment item rated the highest by directors was convection ovens (96%). Additional analysis indicated statistical differences among district/respondent characteristics and the appropriateness of equipment for schools ratings.

Foodservice directors also were asked to rate their level of agreement with 37 statements regarding equipment use in school foodservice operations. Seventy-five percent of the respondents agreed or strongly agreed to 11 of the equipment use statements. The statement with the highest level of agreement was additional refrigerated space is needed when fresh fruits and vegetables are offered (89%).

Directors reported that choices were being offered in elementary schools (63%), middle/junior high (85%), and high school (90%). Three or more entree selections were being offered in 34 percent of elementary schools, 58 percent of middle/junior high schools, and 67 percent of high schools. Fresh fruit and fruit juices were the food items offered daily most often in all three grade levels.

CONCLUSIONS

This study determined school foodservice directors' opinions regarding the appropriateness and use of equipment in school kitchens and identified the number and variety of menu items being offered in elementary, middle/junior high, and high schools. Results indicate that directors' opinions about equipment use in kitchens reflect an increased awareness of preparing school meals which implement the nutrition principles of the DGA.

Findings of the School Nutrition Dietary Assessment (SNDA) study indicated that slightly more than one-half of all school menus offer a choice of entree each day and 35% offer two or three entrees (Burghardt, Gordon, Chapman, Gleason, and Fraker, 1993). Results from this study indicated that a greater percentage of schools are offering menus with choices.

RECOMMENDATIONS

The following are recommendations from this study:

- Results indicate that although the majority of directors agreed that steamers should be used to prepare vegetables and the use of fryers and ranges should be limited, there is still room for improvement. Training modules on implementing the DGAs should emphasize the selection and use of preferred equipment.

- There was considerable agreement among respondents that additional refrigerated, freezer, dry storage, and serving line space was needed when menu choices were offered. Additional research is needed to determine the type and amount of additional space necessitated by expanding menu choices to meet the DGA.

- NFSMI should establish a partnership with the North American Association of Food Equipment Manufacturers to develop a strategy on informing school foodservice directors of the capabilities of new generation equipment which contribute to the goal of implementing DGAs.

ISSUES RELATED TO EQUIPMENT AND THE DIETARY GUIDELINES FOR AMERICANS

INTRODUCTION

In 1990, the United States Department of Agriculture (USDA) and the U.S. Department of Health and Human Services issued the third edition of *The Dietary Guidelines for Americans* (DGA) (U.S. Departments of Agriculture and Health and Human Services, 1990). These Guidelines continued recommendations that levels of fat, saturated fat, and cholesterol in the diet should be reduced; sugar, salt, and sodium should be used in moderation; and the consumption of fruits, vegetables, and grain products should be increased.

Results of the USDA-sponsored School Nutrition Dietary Assessment (SNDA) study indicated that the average levels of fat in meals offered under the National School Lunch Program exceeded the DGA goal; however, in 44 percent of schools, students could select at least one lunch with the five meal components that met the goal of 30 percent or less of food energy from fat (Burghardt, Gordon, Chapman, Gleason, and Fraker, 1993). In 1995, regulations governing nutrition standards for the National School Lunch and School Breakfast Programs were amended to phase in the requirement that school meals comply with the nutrition recommendations of the DGA. This rule also established specific minimum standards for key nutrients and calories that school meals must meet.

Equipment used for production of meals is a critical element in effective implementation of the DGA. Changes in technology, menu offerings, and production techniques are impacting foodservice equipment needs in schools. Technology is affecting the equipment available for the operation of school foodservice programs. New or improved foodservice equipment will enable schools to achieve unprecedented performance goals (Sneed, 1992). Combination convection oven/steamers, conveyor ovens, and two-sided griddles are examples of new equipment being introduced for use in schools (Spertzel, 1991a; Spertzel, 1991b; Mackesey, 1993).

School menus have been expanded; schools are increasing the number of choices of entrees, vegetables, and fruits offered to all ages of children. Findings of the SNDA study indicated that slightly more than one-half of all school menus offer a choice of entree each day, 35 percent offer two or three entrees, and 8 percent offer six or more. A large number of choices at lunch was more prevalent in high schools and middle schools than in elementary schools (Burghardt et al, 1993).

The use of multiple serving lines, including self-service bars, has been increasing for all ages of children. Schools are offering food variety and the opportunity to vary caloric intake by providing self-serve food bars, usually salad bars. About 50% of high schools and 16% of elementary schools offer a food bar at least once per week; many do so more frequently. Salad bars offer an average of

two entree choices, seven vegetable/fruit choices, and one bread/bread alternate choice, as well as salad toppings and dressings (Burghardt et al., 1993).

The most recent large-scale study to examine foodservice equipment in schools was conducted by USDA in 1980 (Puma, 1983). In addition, research has not been conducted to examine the use of foodservice equipment in relationship to implementing the DGA.

Research scientists at the National Food Service Management Institute (NFSMI) initiated a multi-year project to examine production equipment issues related to implementation of the DGA. The purposes of this portion of the research project were to:

1. Determine foodservice directors' opinions regarding use and appropriateness of equipment in school foodservice.

2. Identify the number and variety of menu items offered in elementary, middle/junior high, and high schools.

METHOD

Questionnaire

A mail questionnaire was developed based on a review of the literature and interviews with school foodservice directors. The questionnaire consisted of seven sections: appropriateness of equipment for school kitchens, use of equipment, school district information, elementary school information, middle/junior high school information, high school information, and district director/supervisor information (Appendix A).

In section one, directors were asked to assess how appropriate they believe 31 pieces of equipment are for storage, preparation, or service of meals in school foodservice. The following scale was used to assess the appropriateness of each equipment item:

- 1 very inappropriate, this equipment should never be used in schools
- 2 somewhat inappropriate, this equipment probably should not be used in schools
- 3 neutral
- 4 somewhat appropriate, this equipment might be used in schools
- 5 very appropriate, this equipment should always be used in schools
- NA not familiar with this piece of equipment

Foodservice directors were asked to indicate their level of agreement with 37 recommendations regarding equipment use in school foodservice operations in section two of the questionnaire. Agreement was rated on a five-point scale from 1, strongly disagree to 5, strongly agree.

The final four sections requested information about the school district; elementary schools, middle/junior, and senior high schools; and the district director. Directors/supervisors were asked to indicate the size of the district and respond to various production and service issues related to their elementary, middle/junior, and senior high schools. Personal information requested included years of school foodservice experience, certification status, educational background, and age of the director.

Questionnaire Review

The proposed questionnaire was mailed to six school foodservice directors for review. Each director was interviewed by research scientists to assess whether foodservice directors would understand the type of information being requested, if the equipment listing was complete, and if the rating scales were understandable. Based on suggestions from the foodservice directors, the questionnaire was revised.

The proposal for this research was reviewed and approved by the Education Information Advisory Committee (EIAC) from the Council of Chief State School Officers. The research protocol and questionnaire with corresponding cover letters were approved by the Human Subjects Protection Review Committee at The University of Southern Mississippi.

Pilot Study

A random sample of 40 school foodservice directors was selected to pilot test the revised questionnaire. The questionnaire and cover letter, a one-page cover letter, evaluation form, and a postage-paid return envelope were mailed to the foodservice directors. Pilot study participants were instructed to complete the questionnaire as though they were participating in the study. In addition, directors/supervisors were asked to evaluate the proposed cover letter for clarity and the questionnaire for clarity and completeness of directions, statements, and scales using an evaluation form. Length of time to complete the questionnaire also was solicited.

Research Sample

Research questionnaires were mailed to a national, systematic random sample of 4000 school foodservice directors. The study sample was purchased from Market Data Retrieval, a company that maintains current mailing addresses for both public and private schools throughout the United States.

Data Collection

The questionnaire and two cover letters were mailed to each school foodservice director in the research sample. The first cover letter, from the NFSMI Executive Director, indicated the purpose of the study, emphasized the importance of the data being collected, and introduced the NFSMI researcher involved in the study. The second cover letter explained procedures for participating in the study and encouraged participation in the research. A postage-paid return envelope was included to encourage response. Three weeks after the original mailing, a second letter and questionnaire were

mailed to nonrespondents in the research sample. Coding of questionnaires was done for follow-up purposes only; individuals in the sample were assured that confidentiality of responses would be maintained.

Data Analysis

Programs and routines of the statistical analysis program, $SPSS_X$, was used for all data analyses. Frequencies and percentages of all variables were compiled. Means and standard deviations were computed for all continuous variables. Due to the large sample size, the power for these statistical tests was very high. Therefore, the critical difference was chosen to be mean values of 0.5 or higher and only these differences were examined further to determine where statistical differences existed between responses. Analysis of variance (ANOVA) with Tukey's post hoc tests were conducted to determine if respondents' ratings of appropriateness of equipment (section one of the questionnaire) differed in response by USDA region, size of school district, or personal characteristics of the foodservice director.

RESULTS

Rate of Return

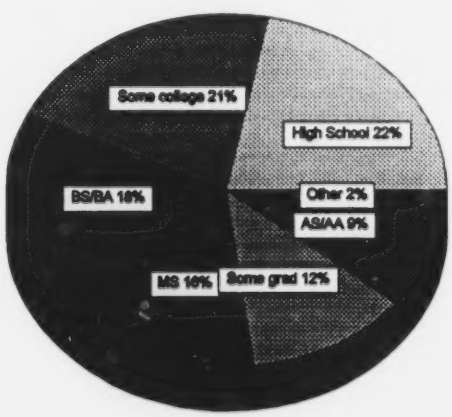
A total of 2245 usable surveys (56%) were returned. This was considered a good rate of return given the length and complexity of the questionnaire.

Respondent Characteristics

The highest level of education for many of the respondents (22%) was a high school diploma. Twenty-one percent had completed some college, 18 percent a baccalaureate degree, and 16 percent a Master's degree (Figure 1). Eleven percent of the respondents were registered dietitians, 43 percent were certified by the American School Food Service Association, and 28 percent were certified by their State Department of Education.

Education

Figure 1



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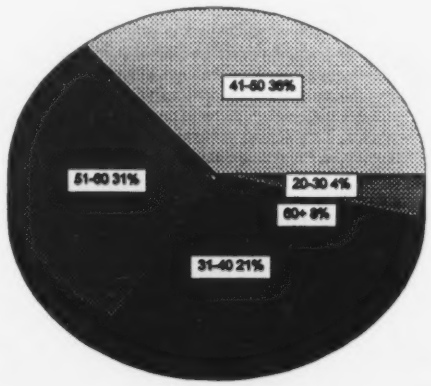
The majority of the respondents indicated that their age was in the range of 41-50 (36%). Thirty-nine percent were over fifty years of age, while only 4 percent were in the age category of 20-30 (Figure 2).

Respondents had worked a mean of 14 ± 8 years in school foodservice and had been employed as a director a mean of 10 ± 7 years. Over two thirds of the respondents reported that they had worked as a school foodservice director between five and twenty years. Twenty-five percent had been employed less than five years (Figure 3).

Age

Figure 2

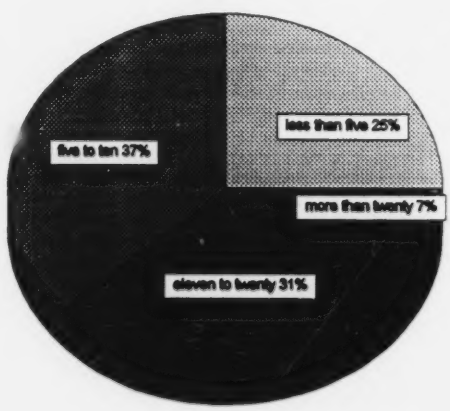


School District Characteristics

Mean enrollment in the school districts represented was 7191 ± 27518. Median enrollment was 2,800 students, indicating that half of the school districts had more than 2,800 and half had fewer than 2,800 students enrolled in their districts.

Years Employed as SFS Director

Figure 3



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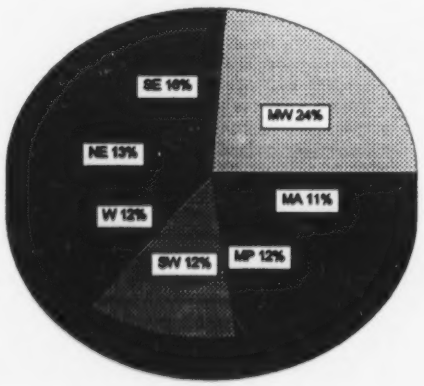
Respondents were employed in school districts located in all of the USDA regions. The largest percentage (24%) of school foodservice directors worked in the Midwest region with the Southeast (16%) and Northeast (13%) regions well represented (Figure 4).

USDA Regions

Figure 4



Food Preparation System

Respondents were asked to indicate how food was being prepared and served for their elementary, middle/junior high, and high schools. Definitions were provided for the respondents as follows:

- on-site - prepare and serve food on-site and do not prepare food for other kitchens;
- base - prepare and serve food on-site and prepare food for delivery to other kitchens;
- central commissary - prepare meals and ship them to other schools, no service of meals is done at this site; and
- satellite - food is prepared at another kitchen and transported to this kitchen.

By far, the majority of the respondents indicated that their schools were using on-site preparation for elementary (76%), middle/junior high (69%), and high schools (68%) (Figure 5). Base kitchens were reported in 30 percent of elementary schools, 27 percent of middle/junior high schools, and 35 percent of high schools.

Twelve percent of the directors indicated that a central commissary was used to prepare meals in their district. When asked how foods were transported to schools, 40 percent of these directors reported that foods prepared at the central commissary were shipped hot, 28 percent were chilling the food and shipping cold, and 32 percent were transporting hot and cold items to schools.

Forty-eight percent of directors reported that they had satellite or receiving kitchens in their school districts. When asked to indicate if personnel were doing any cooking, 48 percent of the directors indicated that cooking was being done at satellite kitchens. Seventy-nine percent reported that baking or preparation requiring an oven was taking place at the satellite kitchens. Directors also reported that personnel at the satellite schools were steaming (19%) and frying (19%) food products.

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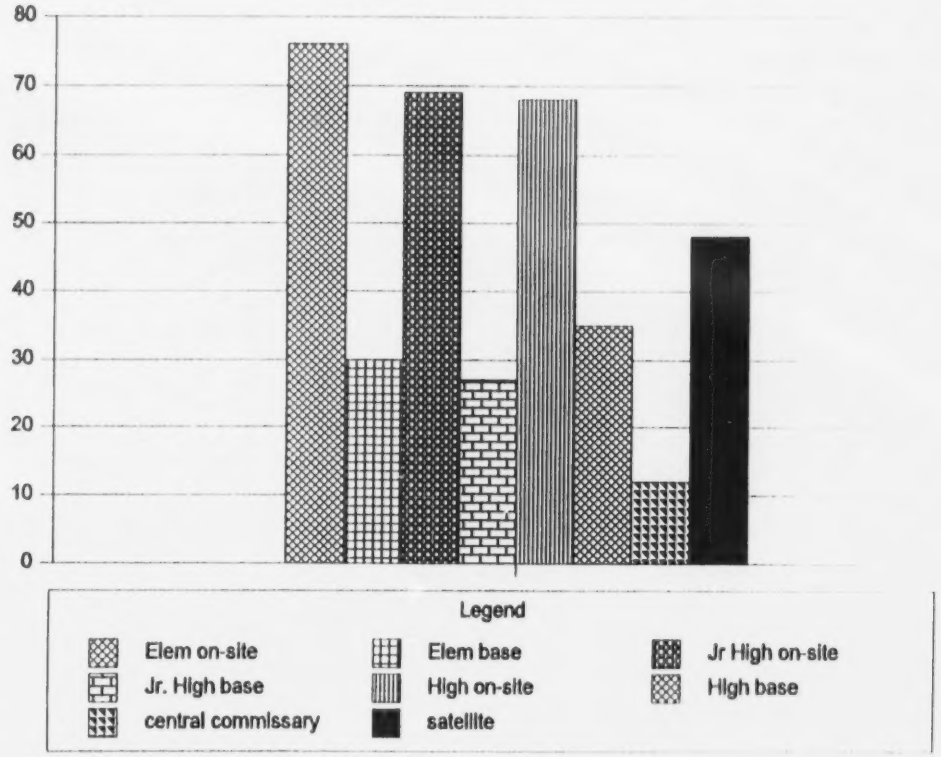
FIGURE 5
Frequency of on-site, base, commissary, and satellite kitchens in schools



Appropriateness of Equipment

Directors were asked to rate the appropriateness of 31 foodservice equipment items used in school kitchens for implementing the Dietary Guidelines for Americans. Six equipment items were identified by 75 percent or more of the respondents as appropriate for school kitchens (Table 1). The equipment item rated the highest by directors was convection ovens (96%). Other equipment included were steam jacketed kettles (85%) and mobile serving carts (75%). Table 2 shows the ten foodservice equipment items rated by 50% - 74% of directors as appropriate equipment for implementing the DGAs. Ranges (73%), tilting braising pans (71%), and convection/pressureless steamers (55%) were some of the equipment items included in this category. Foodservice equipment items rated as appropriate for school kitchens by less than 50% of directors are depicted in Table 3. Included in this listing are deep-fat fryers (45%), low pressure (5 psi) steamers (44%), and soft-serve ice cream machines (37%). The equipment item which had the lowest rating for appropriateness for school kitchens was pressurized fryers (12%).

Table 1. Foodservice equipment rated as appropriate for school kitchens by at least 75% of foodservice directors[a].

Equipment[b]	No. Responding	%[c]
Convection oven	2141	96
Drop-sided milk coolers	1940	88
Steam-jacketed kettles	1867	85
Food cutters/choppers	1801	83
Deck ovens/stack ovens	1688	77
Mobile serving carts (kiosk)	1639	75

[a]N varies from 2171 to 2213
[b]Scale: 1, very inappropriate, this equipment should never be used in schools to 5, very appropriate, this equipment should always be used in schools
[c]Percent selecting somewhat appropriate to very appropriate

Table 2. Foodservice equipment rated as appropriate for school kitchens by 50%-74% of foodservice directors[a].

Equipment[b]	No. Responding	%[c]
Food processors	1616	74
Ranges	1610	73
Tilting braising pans (tilting skillets)	1565	71
Microwave ovens	1540	70
Ice machines	1522	69
Combination convection oven/steamer	1443	66
Convection/pressureless steamer	1209	55
Self-leveling milk coolers	1201	55
Vertical cutter mixers	1093	52
Grills/griddles	1116	51

[a]N varies from 2123 to 2209
[b]Scale: 1, very inappropriate, this equipment should never be used in schools to 5, very appropriate, this equipment should always be used in schools
[c]Percent selecting somewhat appropriate to very appropriate

Table 3. Foodservice equipment rated as appropriate for school kitchens by less than 50% of foodservice directors[a].

Equipment[b]	No. responding	%[c]
Line service equipment (i.e., toasters)	1063	48
Soft-serve yogurt machines	1023	47
Under counter refrigerators	999	45
Deep-fat fryers	999	45
High pressure (15 psi) steamers	958	44
Low pressure (5 psi) steamers	954	44
Ice and chilled water dispensers	845	38
Soft-serve ice cream machines	806	37
Broilers	763	35
Undercounter freezers	748	34
Conveyor ovens	722	33
Conveyor broilers	389	19
Pulpers	340	16
Woks	334	15
Pressurized fryers	274	12

[a]N varies from 2160 to 2213
[b]Scale: 1, very inappropriate, this equipment should never be used in schools to 5, very appropriate, this equipment should always be used in schools
[c]Percent selecting somewhat appropriate to very appropriate

Relationship of District/Respondent Characteristics to Appropriateness of Equipment for Schools

Analysis of variance (ANOVA) with Tukey's post hoc tests were conducted to determine statistical differences among district/respondent characteristics and the appropriateness of equipment for schools ratings at $p<.05$. The characteristics selected for further analysis were USDA region, size of district, years worked as a school foodservice director, and highest level of education.

USDA Region

Significant differences were found for 13 appropriateness of equipment ratings when analyzed by USDA regions ($p<.05$). The equipment items were: vertical cutter mixers, food processors, microwave ovens, deck/stack ovens, ranges, convection/pressureless steamers, tilting braising pans, ice machines, deep-fat fryers, pressurized fryers, ice and chilled water dispensers, pulpers, and line service equipment. Directors in the seven USDA regions differed in their opinion of whether these 13 equipment items were appropriate for school kitchens. Directors in the Southeast USDA region rated food processors, convection/pressureless steamers, and pulpers significantly higher than directors in other regions. Southwest and Southeast directors also rated the appropriateness of tilting braising pans, deep-fat fryers, and pressurized fryers significantly higher. Directors in the Southeast region rated deck/stack ovens and ranges significantly lower (or less appropriate for school kitchens) than directors in the other regions. The final portion of this research project will examine the foodservice equipment actually used in each USDA region.

Size of School District

Significant differences were found for three appropriateness of equipment ratings when analyzed by size of school district ($p<.05$). The equipment items were: microwave oven, deck/stack ovens, and ranges. Directors in small school districts (less than 2800 students) were more likely to view these equipment items as appropriate for school kitchens than directors in larger school districts (5600 or more students).

Years as a School Foodservice Director

When appropriateness of equipment ratings were analyzed by the respondents' years worked as a foodservice director, one significant difference was found ($p<.05$). Foodservice directors with less than five years of experience rated deck/stack ovens significantly more appropriate for school kitchens than directors with more years of experience. Respondents with more than 20 years as a foodservice director rated deck/stack ovens significantly lower (or less appropriate for school kitchens) than directors with 11 to 20 years of experience, five to ten years, as well as the directors with less than five years of experience.

Education Level

Significant differences were found for four equipment items when analyzed by respondents' education level ($p<.05$). These equipment items were: microwave ovens, deck/stack ovens, ranges, and pulpers. Respondents having a bachelor's degree or higher education were less likely to view microwave ovens, deck/stack ovens, and ranges as appropriate foodservice equipment in schools. Directors with a Master's degree rated pulpers significantly higher than other foodservice directors.

Use of Equipment

Foodservice directors were asked to rate their level of agreement with 37 statements regarding equipment use in school foodservice operations on a scale from 5, strongly agree to 1, strongly disagree. Seventy-five percent of the respondents agreed or strongly agreed to 11 of the equipment use statements (Table 4). The statement with the highest level of agreement was additional refrigerated space is needed when fresh fruits and vegetables are offered (89%). Other statements included in this listing were milk coolers should be accessible for all children to serve themselves (86%) and self-service food bars are appropriate for junior/senior high school students (76%). Table 5 shows the seven equipment use statements which received agree or strongly agree ratings from 50% - 74% of foodservice directors. Additional dry storage space is needed when menu choices are offered (73%) and smaller capacities of kettles or braising pans are needed when choices of entrees are offered (55%) are examples of the statements included in this listing. Statements with agree or strongly agree ratings from less than 50% of the respondents are depicted on Table 6. Included in this category are fryers should be used to prepare some items served in schools (39%) and cooking food items in pots on top of a range is an appropriate method of food preparation in schools (23%). The statement which received the lowest agreement rating from directors was self-service heating or cooking should be available for junior/senior high school students (13%).

Computer Availability and Usage

Foodservice directors were asked to indicate the availability of computers in the district office and in the foodservice office in schools. Eighty-seven percent of directors responded that they had computers in the district office (Table 7). Forty-nine percent had computers in the foodservice offices in schools. Word processing was the function that directors used computers for most often (80%) and production the least (20%). Computers were used by 31 percent of respondents for nutrient analysis functions.

Nutrient Analysis of Menus

When asked if they analyzed the nutrient content of menus, 60 percent of directors responded that they did. Most of the directors indicated that they were analyzing the menus monthly (42%). Of those who indicated that nutrient analysis was being conducted, 50 percent indicated that they used a nutrient analysis computer program while the other 50 percent used handbooks. The computer programs most often cited by directors were NutriKids (37%), Nutritionist IV (13%), and Food Processor (11%).

Table 4. Statements regarding equipment use in school foodservice operations with 75% or greater agreement from foodservice directors[a].

Statement[b]	No. Responding	%[c]
Additional refrigerated space is needed when fresh fruits and vegetables are offered	1987	89
Healthy meal choices should be merchandised	1974	89
Milk coolers should be accessible for all children to serve themselves	1908	86
Additional serving line space is needed when menu choices are offered	1902	86
Additional freezer space is needed when menu choices are offered	1889	85
Additional refrigerated space is needed when milk and juice choices are offered	1874	84
Back-up refrigerators and warmers close to the serving line are necessary when offering menu choices	1844	83
Computer hardware and software should be available for doing nutrient analysis	1832	82
Fruits and vegetables should be merchandised on a chilled (refrigerated) serving line	1832	82
Self-service food bars are appropriate for junior/senior high school students	1693	76
Vegetables should be prepared in steamers	1688	76

[a]N varied from 2223 to 2234
[b]Scale: 1, strongly disagree to 5, strongly agree
[c]Percent selecting agree and strongly agree.

Table 5. Statements regarding equipment use in school foodservice with 50% - 74% agreement from foodservice directors[a].

Statement[b]	No. Responding	%[c]
Additional dry storage space is needed when menu choices are offered	1628	73
Food processors or food cutters are necessary pieces of equipment when offering choices of fresh vegetables or salad bars	1625	73
Refrigerated beverage coolers should have the capacity to hold all milk and juice served for a day	1546	70
Mobile carts or kiosks should be used to serve food in areas separate from the cafeteria	1277	58
Refrigerated display cases/cabinets should be used to merchandize chilled food items on the serving line	1249	56
Smaller capacities of kettles or braising pans are needed when choices of entrees are offered	1218	55
Heated display cases/cabinets should be used to merchandize pizzas, etc. on the serving line	1143	51

[a]N varied from 2216 to 2232
[b]Scale: 1, strongly disagree to 5, strongly agree
[c]Percent selecting agree and strongly agree

Table 6. Statements regarding equipment use in school foodservice with less than 50% agreement from foodservice directors[a].

Statement[b]	No. Responding	%[c]
Bakery products are best baked in convection ovens	1024	46
A tilting braising pan (or tilting skillet) is the most versatile piece of equipment in school kitchens	892	41
Fryers should be used to prepare some food items served in schools	867	39
Food courts should be used in high schools	856	39
Self-serve food bars are appropriate for elementary school students	786	35
More than one steamer is required to effectively batchcook vegetables	752	34
Pizza should be prepared in high temperature pizza ovens	727	33
Fruit juices should be served chilled from a juice dispenser	700	32
Chilled water from a dispenser should be available on the serving line	658	30
Food prepared in full view of students in the cafeteria (display cooking) would help increase participation	644	29
Scatter or scramble systems should be used in all high schools	606	28
Cooking food items in pots on top of a range is an appropriate method of food preparation in schools	509	23
Grills or griddles should be used instead of ovens to prepare hamburgers or grilled sandwich products in schools	426	19

Table continued...

Table 6. cont'd

Statement[b]	No. Responding	%[c]
Combination convection oven/steamers should replace all ovens and steamers in schools	420	19
Conveyor broilers should be used to prepare hamburgers, chicken, and other meat products	414	19
Pizzas should be prepared in conveyor ovens	338	17
A tilting braising pan should be used to deep fat fry or pan fry food items	343	16
Conveyor ovens have the necessary production capability to be used in school kitchens	326	15
Self-service heating or cooking should be available for junior/senior high school students	290	13

[a]N varies from 2139 to 2230
[b]Scale: 1, strongly disagree to 5, strongly agree
[c]Percent selecting agree and strongly agree

Table 7. Availability and usage of computer in school foodservice.

Item	N	%
Computers in district office		
Yes	1897	87
No	297	13
Computers in food service office in schools		
Yes	1070	49
No	1130	51
Usage of computers[a]		
Word processing	1216	80
Financial management	1055	69
Inventory	964	63
Purchasing	632	42
Nutrient analysis	468	31
Production	303	20

[a]Percent responding to each option; respondent could have selected more than one option, thus percent does not equal 100.

Elementary School Menu Selections

Sixty-three percent of the respondents indicated that menu choices are being offered in elementary schools (Table 8). Foodservice directors reported that they were offering two or more entrees (92%), vegetable (81%), and fruit (84%) choices. Food items that are being offered four or five times a week in elementary schools include fresh fruit (72%) and fruit juice (64%). Sixty-five percent of directors indicated that they have one serving line and 27 percent had two lines. Salad bars are being offered in 25 percent of elementary schools with at least two meat/meat alternate selections (83%), four or more vegetable choices (67%), and three or more fruit selections (41%).

Table 8. Menu choices offered in elementary schools.

Statement[a]	No. Responding	%
Menu choices offered		
Yes	1364	63
No	819	37
Number of entree choices		
One	103	8
Two	723	59
Three	253	21
Four	90	7
Five	37	3
More than five	20	2
Number of vegetable choices		
One	211	19
Two	597	55
Three	200	18
Four	66	6
Five	11	1
More than five	7	1
Number of fruit choices		
One	186	16
Two	642	57
Three	194	17
Four	74	7
Five	19	2
More than five	16	1
Salad bar offered		
Yes	550	25
No	1637	75

Table continued...

Table 8 cont'd.

Statement[a]	No. Responding	%
Food items offered daily (4-5 times/week)[b]		
Fresh fruit	1107	72
Fruit juice	991	64
Salad bar	387	25
Chef salad	376	24
Pizza	220	14
Hamburger/cheeseburger	180	12
French fries	140	9
Hot dog	137	9
Baked potato	73	5
Fried chicken	27	2

[a]N varies from 1092 to 2183
[b]Percent responding to each item; respondent could have selected more than one item, thus percent does not equal 100.

Middle/Junior High School Menu Selections

Menu choices are being offered to middle/junior high school students as reported by 85 percent of the foodservice directors responding to the questionnaire (Table 9). Respondents indicated that they are offering three or more entrees (58%) and two or more vegetable (90%) and fruit (91%) selections. Food items which are offered daily include fresh fruit (78%), fruit juice (69%), and chef salad (47%). Forty-eight percent of the foodservice directors indicated that they have two serving lines and 18% percent had three lines. Salad bars are being offered in 51 percent of the middle/junior high schools with at least three meat/meat alternate selections (50%), five or more vegetable choices (56%), and three or more fruit selections (50%).

Table 9. Menu choices offered in middle/junior high schools.

Statement[a]	No. Responding	%
Menu choices offered		
Yes	1745	85
No	321	15
Number of entree choices		
One	72	4
Two	627	38
Three	394	24
Four	195	12
Five	141	9
More than five	205	13
Number of vegetable choices		
One	154	10
Two	736	48
Three	360	24
Four	183	12
Five	63	4
More than five	29	2
Number of fruit choices		
One	137	9
Two	766	50
Three	362	24
Four	173	11
Five	63	4
More than five	37	2
Salad bar offered		
Yes	1052	51
No	1012	49

Table continued...

Table 9 cont'd.

Statement[a]	No. Responding	%
Food items offered daily (4-5 times/week)[b]		
Fresh fruit	1383	78
Fruit juice	1228	69
Chef salad	830	47
Salad bar	780	44
French fries	714	40
Pizza	710	40
Hamburger/cheeseburger	657	37
Hot dog	256	14
Baked potato	173	10
Fried chicken	40	2

[a]N varies from 1525 to 2066.
[b]Percent responding to each item; respondent could have selected more than one item, thus percent does not equal 100.

High School Menu Selections

Ninety percent of the directors reported that menu choices are being offered in high schools (Table 10). Respondents indicated that they are offering three or more entrees (67%) and three or more vegetable (50%) and fruit (49%) selections. Food items which are offered daily include fresh fruit (81%), fruit juice (71%), french fries (56%), pizza (52%), and chef salad (52%). Thirty-six percent of the foodservice directors indicated that they have two serving lines, 22 percent had three lines, and 27 percent had four or more serving lines. Salad bars are being offered in 60 percent of the high schools with at least three or more meat/meat alternate selections (57%), five or more vegetable choices (61%), and three or more fruit selections (55%).

Table 10. Menu choices offered in high schools.

Statement[a]	No. Responding	%
Menu choices offered		
Yes	1869	90
No	207	10
Number of entree choices		
One	51	3
Two	521	30
Three	351	20
Four	256	15
Five	202	12
More than five	356	20
Number of vegetable choices		
One	129	8
Two	691	42
Three	417	25
Four	234	14
Five	93	6
More than five	89	5
Number of fruit choices		
One	116	7
Two	731	44
Three	397	24
Four	250	15
Five	85	5
More than five	76	5
Salad bar offered		
Yes	1251	60
No	836	40

Table continued...

Table 10 cont'd.

Statement[a]	No. Responding	%
Food items offered daily (4-5 times/week)[b]		
Fresh fruit	1528	81
Fruit juice	1333	71
French fries	1054	56
Salad bar	1001	53
Pizza	982	52
Chef salad	972	52
Hamburger/cheeseburger	938	50
Hot dog	316	17
Baked potato	270	14
Fried chicken	62	3

[a]N varies from 1653 to 2087.
[b]Percent responding to each item; respondent could have selected more than one item, thus percent does not equal 100.

CONCLUSIONS

This study determined school foodservice directors' opinions regarding the appropriateness and use of equipment in school kitchens and identified the number and variety of menu items being offered in elementary, middle/junior high, and high schools. Results indicate that directors' opinions about equipment use in kitchens reflect an increased awareness of preparing school meals that implement the nutrition principles of the DGA. Only 45 percent of the respondents indicated that deep-fat fryers were appropriate for school kitchens and 39 percent agreed with the statement fryers should be used in high schools. Directors also exhibited this increased awareness of food preparation techniques through responses to the statements: vegetables should be prepared in steamers and cooking food items in pots on top of a range is an appropriate method of food preparation in schools. Seventy-six percent of the respondents agreed with the use of steamers, while only 23 percent concurred with use of ranges to cook food items. When asked about the appropriateness for school kitchens, steamers were not rated very high by directors. Fifty-five percent indicated that convection/pressureless steamers were appropriate equipment for school kitchens, while 44 percent rated high pressure (15 psi) and low pressure (5 psi) steamers as appropriate.

Recent articles have reported that new equipment such as combination convection oven/steamers, conveyor ovens, and two sided griddles are being introduced for use in schools (Spertzel, 1991a; Spertzel, 1991b; Mackesey, 1993). This study confirms this finding as directors indicated that tilting

braising pans (71%), combination convection oven/steamers (66%), grills/griddles (51%), and conveyor ovens (33%) were appropriate for school kitchens.

The majority (87%) of foodservice directors reported that computers are available in the district office and almost half (49%) indicated that computers were in the food service office in the schools. The function most often being performed was word processing (80%), while less than half of the directors were using the computer for purchasing (42%), nutrient analysis (31%), or production (20%) functions.

Findings of the SNDA study indicated that slightly more than one-half of all school menus offer a choice of entree each day and 35% offer two or three entrees (Burghardt et al, 1993). Results from this study indicated that a greater percentage of schools are offering menus with choices. Directors reported that choices were being offered in elementary (63%), middle/junior high (85%), and high (90%) schools. Three or more entree selections were being offered in 34 percent of elementary schools, 58 percent of middle/junior high schools, and 67 percent of high schools. Fresh fruit and fruit juices were the food items offered daily most often in all three grade levels.

RECOMMENDATIONS

The following are recommendations from this study:

- Results indicate that although the majority of directors agreed that steamers should be used to prepare vegetables and the use of fryers and ranges should be limited, there is still room for improvement. Training modules on implementing the DGAs should emphasize the selection and use of preferred equipment.

- There was considerable agreement among respondents that additional refrigerated, freezer, dry storage, and serving line space was needed when menu choices were offered. Additional research is needed to determine the type and amount of additional space necessitated by expanding menu choices to meet the DGA.

- NFSMI should establish a partnership with the North American Association of Food Equipment Manufacturers to develop a strategy on informing school foodservice directors of the capabilities of new generation equipment which contribute to the goal of implementing DGAs.

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APPENDIX A

EQUIPMENT ISSUES QUESTIONNAIRE

(date)

Dear School District Food Service Director/Supervisor,

We need your help with a research project on equipment use in school kitchens that is being conducted by the National Food Service Management Institute. Information from this project will be used to help provide directors/supervisors, such as yourself, with important information to assist with implementing the Dietary Guidelines for Americans.

Data for this study will be collected in two mailings. This first mailing includes a questionnaire requesting your opinion related to equipment issues in schools and information about your school district. The second mailing, which you will receive next spring, will ask for information about some of the equipment in one of your kitchens. We would greatly appreciate your participation throughout the study.

The enclosed questionnaire should take about 15 minutes of your time to complete. The questionnaire is numbered only to assist us with contacting nonrespondents. Your individual responses will remain strictly confidential; results will be reported in summary form only. A postage-paid, return envelope is enclosed to facilitate mailing your questionnaire back.

Thank you for your assistance with this project. Having your input is critical to the success of this study. Please write or call if we can provide any additional information about the study.

Sincerely,

Mary Frances Nettles, PhD, RD
Research Scientist

c: J. Martin
R. Maize

FOOD SERVICE EQUIPMENT ISSUES

Section I. Appropriateness of Equipment for School Kitchens

This section will assess how appropriate for implementing the Dietary Guidelines for Americans you believe each of the following pieces of equipment is for storage, production, or service of meals in school food service. Circle the number corresponding to the level of appropriateness using this scale:

1 very inappropriate, this equipment should never be used in schools
2 somewhat inappropriate, this equipment probably should not be used in schools
3 neutral
4 somewhat appropriate, this equipment might be used in schools
5 very appropriate, this equipment should always be used in schools
NA not familiar with this piece of equipment

Vertical Cutter Mixers	1	2	3	4	5	NA
Food Processors	1	2	3	4	5	NA
Food Cutters/Choppers	1	2	3	4	5	NA
Microwave Ovens	1	2	3	4	5	NA
Convection Ovens	1	2	3	4	5	NA
Deck Ovens/Stack Ovens	1	2	3	4	5	NA
Conveyor Ovens	1	2	3	4	5	NA
Combination Convection Oven/Steamer	1	2	3	4	5	NA
Ranges	1	2	3	4	5	NA
Grills/Griddles	1	2	3	4	5	NA
Broilers	1	2	3	4	5	NA
Conveyor Broilers	1	2	3	4	5	NA
Convection/Pressureless Steamers	1	2	3	4	5	NA
Low Pressure (5 psi) Steamers	1	2	3	4	5	NA
High Pressure (15 psi) Steamers	1	2	3	4	5	NA

1 very inappropriate, this equipment should never be used in schools

2 somewhat inappropriate, this equipment probably should not be used in schools

3 neutral

4 somewhat appropriate, this equipment might be used in schools

5 very appropriate, this equipment should always be used in schools

NA not familiar with this piece of equipment

Steam Jacketed Kettles	1	2	3	4	5	NA
Tilting Braising Pans (Tilting Skillets)	1	2	3	4	5	NA
Mobile Serving Carts (Kiosk)	1	2	3	4	5	NA
Soft-Serve Ice Cream Machines	1	2	3	4	5	NA
Soft-Serve Yogurt Machines	1	2	3	4	5	NA
Ice Machines	1	2	3	4	5	NA
Drop-Sided Milk Coolers	1	2	3	4	5	NA
Self-Leveling Milk Coolers	1	2	3	4	5	NA
Under Counter Refrigerators	1	2	3	4	5	NA
Under Counter Freezers	1	2	3	4	5	NA
Deep-Fat Fryers	1	2	3	4	5	NA
Pressurized Fryers	1	2	3	4	5	NA
Woks	1	2	3	4	5	NA
Ice and Chilled Water Dispensers	1	2	3	4	5	NA
Pulpers	1	2	3	4	5	NA
Line Service Equipment (i.e. toasters)	1	2	3	4	5	NA

Section II. Use of Equipment

Below are statements regarding equipment use in school food service operations. Circle your agreement with each statement using the following scale:

1 strongly disagree
2 disagree
3 neither disagree nor agree
4 agree
5 strongly agree

Additional freezer space is needed when menu choices are offered	1	2	3	4	5
Additional refrigerated space is needed when fresh fruits and vegetables are offered	1	2	3	4	5
Additional refrigerated space is needed when milk and juice choices are offered	1	2	3	4	5
Additional dry storage space is needed when menu choices are offered	1	2	3	4	5
Additional serving line space is needed when menu choices are offered	1	2	3	4	5
Smaller capacities of kettles or braising pans are needed when choices of entrees are offered	1	2	3	4	5
Food processors or food cutters are necessary pieces of equipment when offering choices of fresh vegetables or salad bars	1	2	3	4	5
Back-up refrigerators and warmers close to the serving line are necessary when offering menu choices	1	2	3	4	5
Vegetables should be prepared in steamers	1	2	3	4	5
Conveyor broilers should be used to prepare hamburgers, chicken, and other meat products	1	2	3	4	5
Fryers should be used to prepare some food items served in schools	1	2	3	4	5
Combination convection oven/steamers should replace all ovens and steamers in schools	1	2	3	4	5
Cooking food items in pots on top of a range is an appropriate method of food preparation in schools	1	2	3	4	5
A tilting braising pan should be used to deep fat fry or pan fry food items	1	2	3	4	5
Grills or griddles should be used instead of ovens to prepare hamburgers or grilled sandwich products in schools	1	2	3	4	5
Conveyor ovens have the necessary production capability to be used in school kitchens	1	2	3	4	5
More than one steamer is required to effectively batch cook vegetables	1	2	3	4	5
Bakery products are best baked in convection ovens	1	2	3	4	5

1 strongly disagree
2 disagree
3 neither disagree nor agree
4 agree
5 strongly agree

Foods prepared in full view of students in cafeteria (display cooking) would help increase participation	1 2 3 4 5
Pizza should be prepared in conveyor ovens	1 2 3 4 5
Pizza should be prepared in high temperature pizza ovens	1 2 3 4 5
A tilting braising pan (or tilting skillet) is the most versatile piece of equipment in school kitchens	1 2 3 4 5
Self-service food bars are appropriate for elementary school students	1 2 3 4 5
Self service food bars are appropriate for junior/senior high school students	1 2 3 4 5
Healthy meal choices should be merchandized	1 2 3 4 5
Computer hardware and software should be available for doing nutrient analysis	1 2 3 4 5
Scatter or scramble systems should be used in all high schools	1 2 3 4 5
Food courts should be used in high schools	1 2 3 4 5
Fruits and vegetables should be merchandized on a chilled (refrigerated) serving area	1 2 3 4 5
Fruit juices should be served chilled from a juice dispenser	1 2 3 4 5
Refrigerated beverage coolers should have the capacity to hold all milk and juice served for a day	1 2 3 4 5
Milk coolers should be accessible for all children to serve themselves	1 2 3 4 5
Heated display cases/cabinets should be used to merchandize pizzas, etc on the serving line	1 2 3 4 5
Refrigerated display cases/cabinets should be used to merchandize chilled food items on the serving line	1 2 3 4 5
Mobile carts or kiosks should be used to serve food in areas separate from the cafeteria	1 2 3 4 5
Chilled water from a dispenser should be available on the serving line	1 2 3 4 5
Self service heating or cooking should be available for junior/senior high school students	1 2 3 4 5

Please turn page →

Section III. School District Information:

1. In which state is your district located? _____

2. How many students are enrolled in your district? _____

3. How many elementary schools do you have in your district that do only onsite preparation and service (i.e. prepare and serve food on-site and do not prepare food for other kitchens)?

   _____

4. How many elementary schools do you have in your district that have a base kitchen (i.e. prepare and serve food on-site and prepare food for delivery to other kitchens)?

   _____

5. How many middle/junior high schools do you have in your district that do only onsite preparation and service (i.e. prepare and serve food on-site and do not prepare food for other kitchens)?

   _____

6. How many middle/junior high schools do you have in your district that have a base kitchen (i.e. prepare and serve food on-site and prepare food for delivery to other kitchens)?

   _____

7. How many senior high schools do you have in your district that do only onsite preparation and service (i.e. prepare and serve food on-site and do not prepare food for other kitchens)?

   _____

8. How many senior high schools do you have in your district that have a base kitchen (i.e. prepare and serve food on-site and prepare food for delivery to other kitchens)?

   _____

9. Do you have a central commissary kitchen in your district (i.e. one that prepares meals and ships them to other schools, no service of meals is done at this site)?

   ___ no
   ___ yes - are foods transported hot or chilled and shipped cold? _____

10. How many schools in your district have a satellite/receiving kitchen (i.e. food is prepared at another kitchen and transported to this kitchen)? _____

    Is any cooking done in these satellite/receiving kitchens?
    ___ no
    ___ yes
        What cooking is done?
        ___ baking (preparation requiring an oven)
        ___ steaming (preparation requiring a steamer)
        ___ frying (preparation requiring a fryer)
        ___ other, please specify: _____

11. Do you include "offer vs. serve" in any of your schools?
___ no
___ yes
What grades are receiving it? _____

12. Has your school district implemented a nutrition integrity policy?
___ no
___ yes

13. Do you do nutrient analysis of your menus?
___ no
___ yes
How often are menus analyzed? _____

14. Do you have any computers in use in your district office?
___ no
___ yes, please provide information about the type and capacity:

15. Do you have any computers in use in food service offices in schools in your district?
___ no
___ yes, please provide information about the type and capacity:

16. Please check which, if any, of the following functions you use computer programs for and what program is used:
___ purchasing (program used: _____)

___ inventory (program used: _____)

___ production (program used: _____)

___ financial management (program used: _____)

___ nutrient analysis (program used: _____)

___ word processing (program used: _____)

Please turn page →

Section IV. Elementary School Information

1. Do you offer menu choices in your elementary schools?
   ___ no
   ___ yes, indicate number of choices offered (not including salad bar):
   Number of entree choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

2. Do you offer a salad bar in your elementary schools?
   ___ no
   ___ yes, indicate number of choices offered:
   Number of meat/meat alternate choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

3. What is the average number of serving lines you have in your elementary schools? _____

4. Do you offer a la carte items in your elementary schools?
   ___ no
   ___ yes - what items are offered:
   _____
   _____

5. Which, if any, of the following menu items are offered daily (4-5 times/week) in your elementary schools? (check all that apply)
   ____ hamburger/cheeseburger
   ____ hot dog
   ____ pizza
   ____ fried chicken
   ____ french fries
   ____ baked potato
   ____ chef salad
   ____ fruit juice
   ____ fresh fruit
   ____ salad bar
   ____ other, please indicate:
   _____
   _____

Section V. Middle/Junior High School Information

1. Do you offer menu choices in your middle/junior high schools?
   ___ no
   ___ yes, indicate number of choices offered (not including salad bar):
   Number of entree choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

2. Do you offer a salad bar in your middle/junior high schools?
   ___ no
   ___ yes, indicate number of choices offered:
   Number of meat/meat alternate choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

3. What is the average number of serving lines you have in your middle/junior high schools? _____

4. Do you offer a la carte items in your middle/junior high schools?
   ___ no
   ___ yes - what items are offered:
   _____
   _____

5. Which, if any, of the following menu items are offered daily (4-5 times/week) in your middle/junior high schools? (check all that apply)
   ____ hamburger/cheeseburger
   ____ hot dog
   ____ pizza
   ____ fried chicken
   ____ french fries
   ____ baked potato
   ____ chef salad
   ____ fruit juice
   ____ fresh fruit
   ____ salad bar
   ____ other, please indicate:
   _____
   _____

Section VI. High School Information

1. Do you offer menu choices in your high schools?
   ___ no
   ___ yes, indicate number of choices offered (not including salad bar):
   Number of entree choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

2. Do you offer a salad bar in your high schools?
   ___ no
   ___ yes, indicate number of choices offered:
   Number of meat/meat alternate choices _____
   Number of vegetable choices _____
   Number of fruit choices _____

3. What is the average number of serving lines you have in your high schools? _____

4. Do you offer a la carte items in your high schools?
   ___ no
   ___ yes - what items are offered:
   _____
   _____

5. Which, if any, of the following menu items are offered daily (4-5 times/week) in your high schools? (check all that apply)
   ____ hamburger/cheeseburger
   ____ hot dog
   ____ pizza
   ____ fried chicken
   ____ french fries
   ____ baked potato
   ____ chef salad
   ____ fruit juice
   ____ fresh fruit
   ____ salad bar
   ____ other, please indicate:
   _____
   _____

Section VII. District Director/Supervisor Information

1. How many years have you worked as a school food service director/supervisor? _____

2. How many years have you worked in school food service? _____

3. What is your current position title?
   _____

4. How many years have you been in this position?
   _____

5. What is your certification status?
   (check all that apply)
   ___ NOT certified
   ___ State Department of Education certified
   ___ ASFSA certified
   ___ Registered Dietitian

6. What is your highest level of education?
   ___ high school
   ___ some college
   ___ associate or two-year degree
   ___ baccalaureate degree
   ___ some graduate
   ___ master's degree
   ___ doctorate degree
   ___ other: _____

7. What is your age?
   ___ less than 20
   ___ 20 - 30
   ___ 31 - 40
   ___ 41 - 50
   ___ 51 - 60
   ___ greater than 60

Return to: Mary Frances Nettles, PhD, RD
National Food Service Management Institute
Box 10077
Hattiesburg, MS 39406-0077

Thank you for your assistance with this research

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